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DETERMINATION OF THE VALUE OF FIRE PROTECTION AFFORDED BY THE QUEENS COUNTY WATER COMPANY*

By Joseph Goodman

There are several private water companies operating within the city limits of Greater New York supplying an average of 38,000,000 gallons daily to a population of about 400,000. The city has been paying six of these companies $130,000 a year for hydrant rental in the shape of a fixed amount per annum per hydrant except in the case of the Flatbush Water Works Company which receives a lump sum per annum for fire service and most other public uses.

An investigation is now being made by the Department of Water Supply, Gas and Electricity of the entire plants of these companies with a view of determining their adequacy for furnishing a supply for domestic consumption and fire service. Appraisal of the companies' properties necessary and useful in the supply of water for domestic and public purposes, and inquiries into the proper allowances for current depreciation, operating expenses and taxes are being made for the purpose of establishing fair rates to private consumers; (in the case of three of the companies at present supplying 19,000,000 gallons daily the domestic rates are higher than the city's), also for determining the fair cost of fire service to be paid by the city, and for ultimate acquisition of the distribution systems by the city. Rates for water used for domestic and public purposes and for fire protection, based upon this appraisal, in the case of the Queens County Water Company, were recently established and put into force.

It is the purpose of this paper to outline in a general way the methods pursued in determining one of the problems involved in the investigation of this company, viz.: the determination of the value of fire protection afforded by it.

AREA AND POPULATION SERVED

The Queens County Water Company supplies the Rockaway peninsula, constituting the fifth ward, borough of Queens, New York

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* Presented at meeting of New York Section.

City, including the former incorporated villages of Far Rockaway, Arverne, Rockaway Beach and the more recent developments of Belle Harbor, Neponsit and Edgemere, as well as a very considerable portion of the town of Hempstead, Nassau County. The Queens district now served by the company is about 7 miles long, with an average width of 1 mile. About 70 per cent of the company's business is done in Queens, while the bulk of the water supply, lands, wells and mechanical equipment, also a portion of the distribution system, lie within the county of Nassau.

The territory covered by the company's franchise, the districts supplied by it and the general relations of its property are shown on the accompanying map.

According to the last state census, the fifth ward in Queens has a permanent population of 21,000; this is more than doubled in the summer months. There is also a great influx of week end visitors who crowd the hotels and beaches merely for a day, or a few days at most. These conditions result in a comparatively very high peak load of water consumed during the summer months, especially on certain days in July and August. That part of Hempstead which the company now serves comprises roughly an area of about 30 square miles with a population of approximately 20,000. While there is an influx of summer population, it is relatively less than in Queens, and the peak load is less marked.

BRIEF DESCRIPTION OF THE COMPANY'S PLANT

The main source of supply is from a system of driven wells with an estimated capacity, as at present developed, of about 12,000,000 gallons daily, at the site of the Fenhurst pumping station near Valley Stream, Nassau County. Water is pumped from the wells into three slow sand filter beds, of a total area of 1½ acres, to remove the iron; it is then repumped into the distribution system. The pumping equipment consists of nine pumps of a total rated capacity of 42,000,000 gallons daily; taking the double pumping into consideration and the necessity of maintaining a proper reserve, the actual safe capacity for continuous service is 16,000,000 gallons daily.

At Rockaway Beach there is a small auxiliary station, deriving its supply from three deep wells; it is operated during the hours of peak load on days of heavy draft at a rate of approximately 500,000 gallons daily.

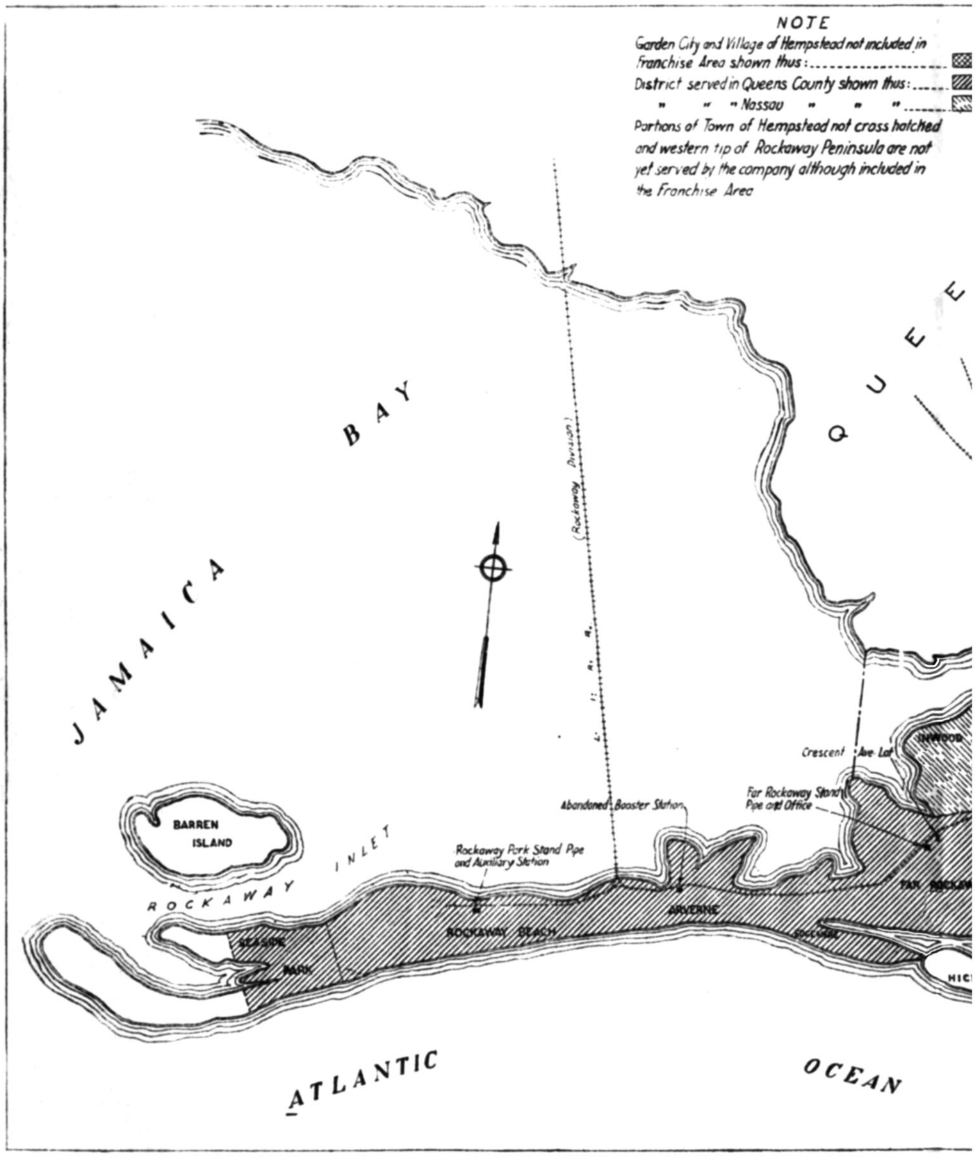
From the Fenhurst pumping station two 16-inch and one 24-inch trunk mains, each 4 miles in length, extend to Queens. The Queens distribution mains consist of 84 miles of mains ranging in size from 1½-inch to 24-inch; 7 per cent are 16-inch, 6 per cent 12-inch, 12 per cent 8-inch, 57 per cent 6-inch and 17 per cent 4-inch or smaller. A standpipe at Far Rockaway 20 x 140 feet and one at Rockaway Beach 18 by 130 feet are maintained on the system.

FIRE HYDRANT RENTAL

Under a contract which expired in 1902, the company was paid a fire hydrant rental of $20 per hydrant per annum, which sum also included the furnishing of water for certain public purposes. This price was based upon previous contracts with the villages and was fixed in 1898 by the Board of Public Improvements of the City of New York, for all private companies operating within the city limits, without adequate consideration of the cost of fire service or allowance for difference of conditions in different parts of the city. Since 1902 the company has continued to render service and has been paid therefor the rates previously prevailing.

AUTHORITY OF THE COMMISSIONER OF WATER SUPPLY, GAS AND ELECTRICITY

The commissioner of Water Supply, Gas and Electricity of the city of New York is authorized under the charter, "to examine into the sources of water supply of any private company supplying the city of New York or any portion thereof, or its inhabitants with water, to see that the same is wholesome and the supply is adequate, and to establish such rules and regulations in respect thereof as are reasonable and necessary for the convenience of the public and the citizens." The commissioner may also "exercise superintendence, regulation and control in respect of the supply of water by such water companies, including rates, fares and charges to be made therefor, except that such rates, fares and charges shall not, without the consent of the grantee, be reduced by the said commissioner beyond what is just and reasonable; and in case of a controversy, the question of what is just and reasonable shall be finally determined as a judicial question on its merits by a court of competent jurisdiction."



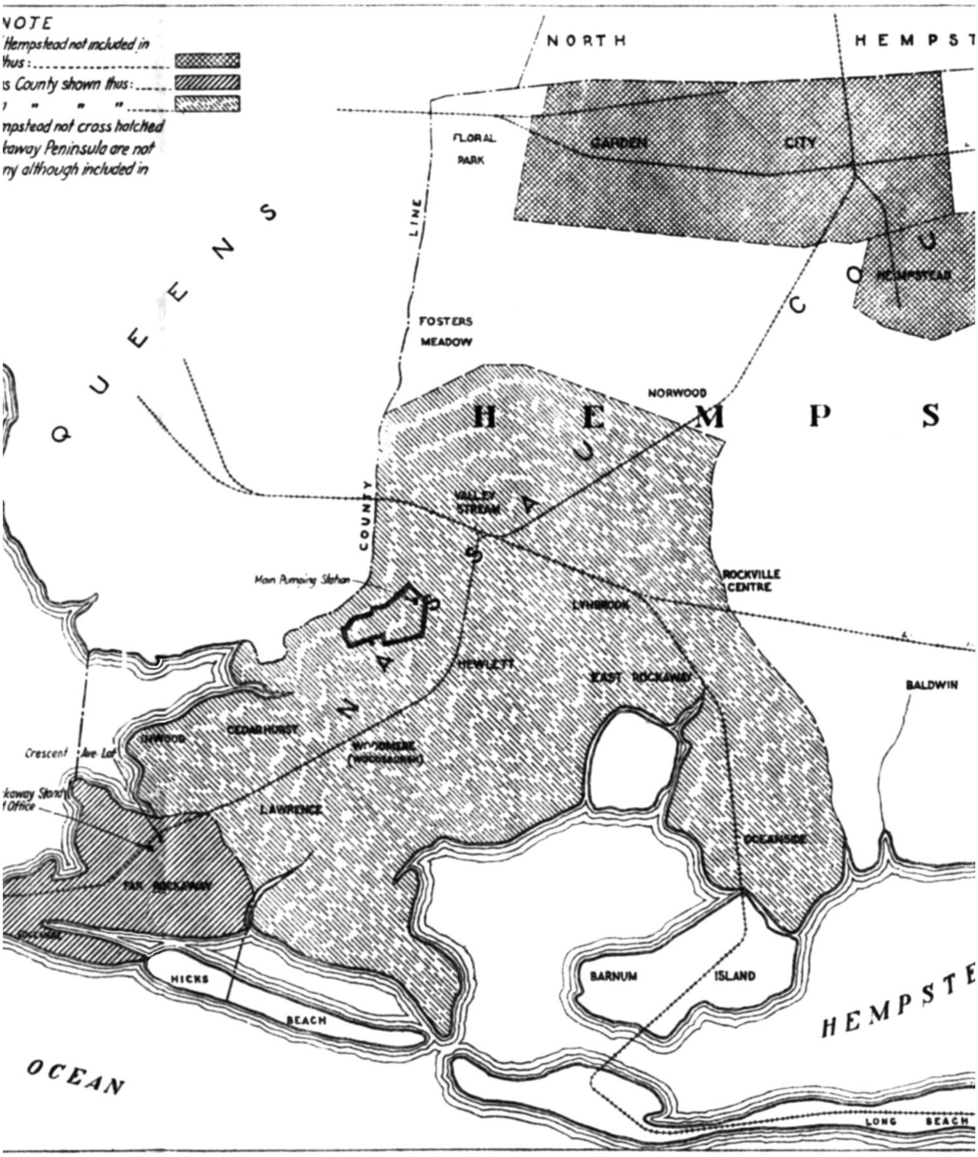
NOTE

Garden City and Village of Hempstead not included in Franchise Area shown thus:………… ▩

District served in Queens County shown thus:………… ▨

" " " Nassau " " "………… ▧

Portions of Town of Hempstead not cross hatched and western tip of Rockaway Peninsula are not yet served by the company although included in the Franchise Area


NOTE
Hempstead not included in
thus:
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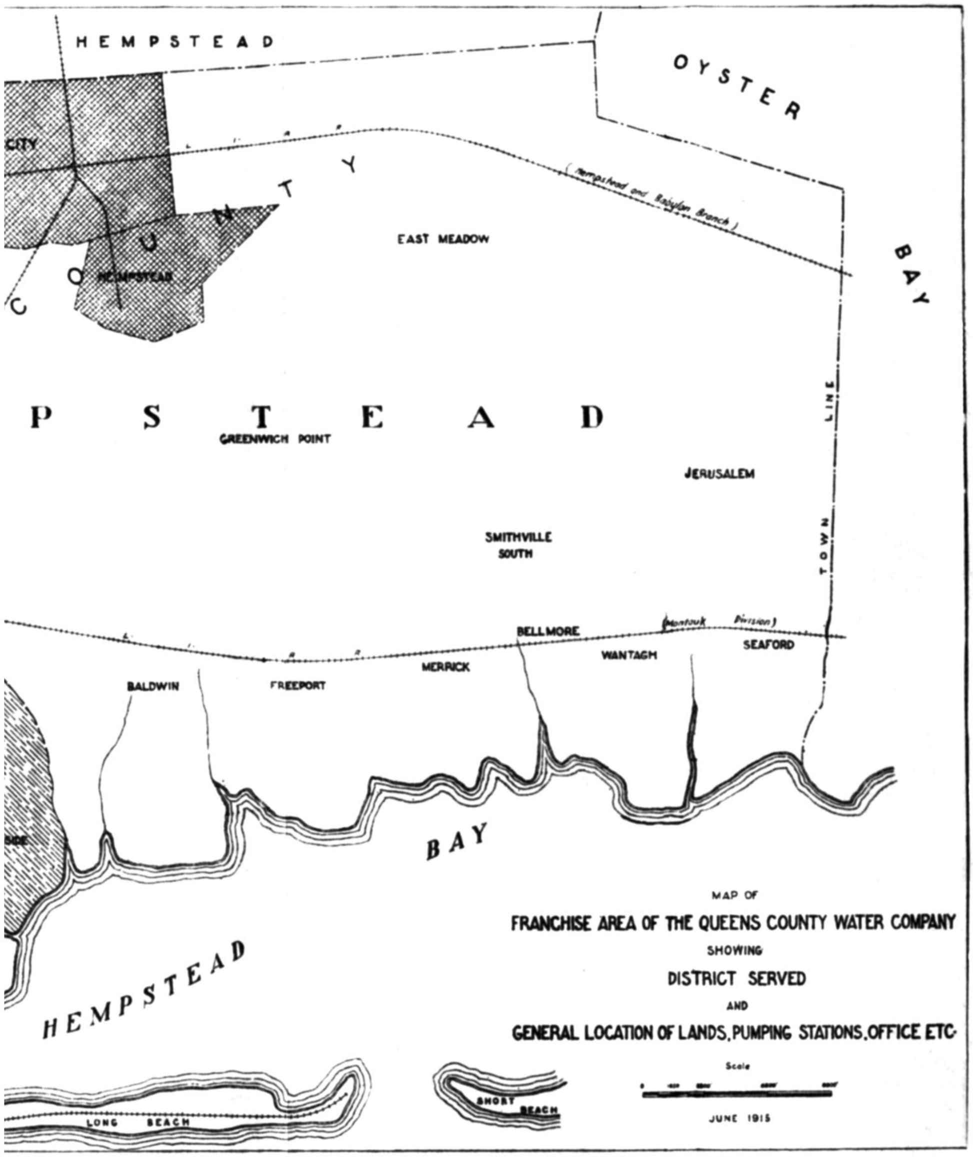
mpstead not cross hatched
kaway Peninsula are not
ny although included in
NORTH
HEMPST
FLORAL PARK
GARDEN CITY
HEMPSTEAD
LINE
FOSTERS MEADOW
COUNTY
QUEENS
NORWOOD
H E M P S
NASSAU
COU
VALLEY STREAM
ROCKVILLE CENTRE
Main Pumping Station
LYNBROOK
HEWLETT
EAST ROCKAWAY
BALDWIN
INWOOD
CEDARHURST
WOODMERE (WOODSBURGH)
Crescent Ave. Lat.
kaway Stand
l Office
LAWRENCE
OCEANSIDE
FAR ROCKAWAY
HICKS BEACH
BARNUM ISLAND
HEMPSTE
OCEAN
LONG BEACH



MAP OF
FRANCHISE AREA OF THE QUEENS COUNTY WATER COMPANY
SHOWING
DISTRICT SERVED
AND
GENERAL LOCATION OF LANDS, PUMPING STATIONS, OFFICE ETC.

APPORTIONMENT BETWEEN QUEENS AND NASSAU DISTRICTS

Since the jurisdiction of the commissioner as to rates extends only to the portion of the company's territory lying within the city limits, it was necessary to determine the relation between the company's earnings in Queens and the portion of its investment properly chargeable to it. The latter was determined as follows:

All domestic services are metered; the actual metered consumption during the summer months of June, July and August was 2,766,000 gallons a day in Queens, and 802,000 gallons a day in Nassau; the sum of these was 77.3 of the pumpage figured. The pumpage was apportioned in the foregoing metered ratio of 77.5 per cent to 22.5 per cent. The average maximum hourly rates during the summer months were found from the pumping records to be 75 per cent greater than the average daily rates for the same period. The average peak load of pumpage during the hours of maximum use was thus established at 6,200,000 gallons a day (2,766,000 ÷ 77.3 per cent × 1.75) for Queens and 1,800,000 gallons a day (802,000 ÷ 77.3 per cent × 1.75). To these average peak loads for the two areas was added a maximum fire rate of 7,000,000 gallons a day for Queens and 3,000,000 gallons a day for Nassau, resulting in a ratio of 73.4 per cent of the total capacity chargeable to Queens and 26.6 per cent to Nassau. This ratio was applied to the investment in the pumping plant, buildings and general equipment.

To distribute the investment in the trunk mains in Nassau serving both Queens and Nassau, a further adjustment was made on account of the fact that the Queens supply was all delivered at the city line, while the Nassau supply was taken off at different points, and partly through a separate main; a ratio of 76.8 per cent to 23.2 per cent was established for these trunk mains.

For the well system, suction lines, filters and lands, a ratio of 72.4 per cent and 27.6 per cent was established, based upon the total pumpage during the summer months plus fire reserve, it having been assumed that the reserve in the filter beds and standpipes would take care of the hourly peak.

The allocation of investment as between Queens and Nassau services may be summarized as follows:

	QUEENS	NASSAU
	per cent	*per cent*
Land	72.4	27.6
Water supply sources and works	72.4	27.6
Buildings and mechanical equipment	73.4	26.6
Tools and supplies	73.4	26.6
Trunk mains in Nassau	76.8	23.2

GENERAL PROCEDURE ADOPTED TO DETERMINE COMPENSATION FOR FIRE PROTECTION

To determine the compensation for the fire protection furnished by the company in Queens, which is paid by the city at large, the following procedure, which is also being used in cases of the other private companies operating within the city limits, was adopted: The investment in various portions of the existing plant as actually constructed for both domestic services and fire protection was ascertained; an estimate was then made of the investment in the various portions of the plant necessary to make them fully adequate for domestic service without reference to fire protection. The difference between the two figures was regarded as the portion of the investment chargeable to fire service. This proportion was applied to the total investment chargeable to the Queens service, and the cost of fire protection properly chargeable to the city for the Queens area was estimated upon the basis of a fair return upon the extra capital invested in this service, together with a proper allowance for depreciation, taxes, maintenance and operation.

Since the major portion of the investment chargeable to fire service would remain the same irrespective of the number of fire hydrants in use, the cost of fire service was divided into two parts: First, the cost attributable to the general fixed investment, which would be measured as a lump sum per annum, and second, the cost attributable to the particular investment in, and maintenance of, fire hydrants, which would be measured in the form of a fixed sum per hydrant per annum.

The plant was established primarily for the purpose of selling water to private consumers at a profit and the adaptation to the demands of the general public for fire protection has been rather incidental to the main purpose of the enterprise, although payment for fire hydrant rental was undoubtedly anticipated. The basis adopted for estimating the proportion of the cost of the service chargeable to fire protection, in this instance at least, was therefore deemed more equitable than the plan followed by the Wisconsin Commission of assigning the investment in the existing plant to fire service and to domestic use in proportion to the relative costs of two assumed independent plants, one for domestic service without fire protection and the other adequate for fire protection without regard to domestic service.

CAPACITY OF THE SYSTEM FOR FIRE PROTECTION

Preliminary to the work of valuation, and incidental to it, an investigation was made of the entire plant as to its adequacy for providing domestic service and fire protection. The capacity of the trunk mains in Nassau was computed from the delivery head at the pumps and elevation of the Far Rockaway standpipe. The capacities and gradients at different points in the Queens distribution system were computed and the available fire service in excess of the maximum domestic consumption determined.

On a Monday at the end of July when the domestic draft was close to a maximum, tests were made of the flow from groups of hydrants at representative locations in the distribution system. These locations were selected according to the character and occupancy of the buildings where good fire protection was deemed necessary. The hydrants in each group were opened simultaneously and allowed to flow freely for a period of about two minutes, the discharge from each hydrant being found by a Pitot tube gauge. At the same time static pressures were taken in the mains above and below the hydrant group, starting about ten minutes before and continuing for the same period after the hydrants were shut down. The pumping records, pressure gauge charts and elevations of water in standpipe during the tests were obtained and supplementary tests were made on dead end mains, especially 4-inch.

The results of the tests were conclusive indications of the necessity of additional mains as determined by the computations.

It was considered by members of the Fire Department that for the development in Neponsit, Belle Harbor and Rockaway Park, consisting mostly of detached cottages, six fire streams, of 250 gallons per minute each, would furnish ample protection; for Seaside, Holland and Arverne, bounded by Fifth Avenue on the west and

Park Avenue on the east, as well as for sections of Far Rockaway and Edgemere, consisting of closely built-up areas of two and three story buildings, twelve streams would be sufficient; for Arverne east of Park Avenue, eight streams, and for Lawrence, Cedarhurst, Woodmere and Hewlett, in Nassau, from six to eight streams.

The fire engine companies in the fifth ward with the arrangement for emergency help from the mainland via the Long Island Railroad, could furnish 18 fire streams of 250 gallons per minute each. It was conceded that a conflagration in the fifth ward requiring a rate of delivery of between 6,000,000 and 7,000,000 gallons daily was possible.

These figures agree closely with the general recommendations of the National Board of Fire Underwriters for a minimum of 1500 gallons per minute in outlying residential districts, 3000 to 5000 gallons per minute in densely built residential sections of two and three story buildings, and from 5000 to 10,000 gallons per minute in densely built residential sections containing large area buildings and buildings four stories and higher.

ALLOCATION OF QUEENS INVESTMENT BETWEEN DOMESTIC SERVICE AND FIRE PROTECTION

The proportion of the value of the mains and appurtenances in the fifth ward chargeable to fire protection was obtained by laying out a distribution system that would give adequate service for domestic consumption only, and obtaining the difference in cost between such a system and the existing one. This gave 26.2 per cent as the proportion chargeable to fire protection.

With the strengthening of the distribution system recommended, the proportion of the mains and appurtenances in the fifth ward chargeable to fire protection, figured in this manner, would be increased from 26.2 per cent to 36 per cent. The distribution of the investment in the trunk mains in Nassau County was arrived at by similar methods.

In regard to water bearing lands, wells and suction lines, it was estimated from the records of suction lift and pumpage that the maximum capacity of wells as at present developed, was 12,000,000 gallons daily. The average peak load for domestic service during the summer months is approximately 8,000,000 gallons daily and it was assumed that any peak load in excess of this, for a brief period, could be readily taken care of without a well capacity in excess of 8,000,000 gallons and that the storage of 1,500,000 gallons in the filters would furnish the balance of water required for fire protection, the raw water being pumped directly into the system in case of emergency. It was therefore estimated that two-thirds of the developed well capacity and two-thirds of the investment in wells, suction lines and water bearing lands were attributable to domestic service, leaving one-third as the extra investment made necessary on account of fire service.

In determining the distribution of cost between domestic and fire service of the buildings, mechanical equipment, coal storage and railroad siding, it was assumed that

1. For all buildings not directly contributory to the pumping of water, 100 per cent shall be charged to domestic service.
2. For all buildings contributory to the pumping of water, 75 per cent of the cost shall be charged to domestic service and 25 per cent to fire; this was based upon the estimated cost of housing and equipment with a capacity of 8,000,000 gallons a day.
3. For all apparatus, equipment and plant contributory to the pumping of water, the distribution of cost shall be 50 per cent against domestic service and an equal amount against fire service. This proportion was based upon the ratio of the safe continuous capacity of the pumping plant to capacity for average domestic peak load.

The investment attributable to the Queens service is given in the table on the following page.

OPERATING EXPENSES

The entire plant being operated as a whole, the exact distribution of expenses between the Queens and Nassau services, widely different in character, was very difficult. It was decided to distribute administration expenses, including salaries, office supplies and office expenses, meter reading, inspection and collection on the basis of gross revenues in the two districts. The expense of operating the pumping station and filters at Fenhurst, the maintenance of boilers, machinery and wells, of brooks and streams, was distributed on the basis of the total amount of water consumed in the two areas. The expense of maintaining the mains was distributed on the basis of the investment in mains attributed to the two services. The expense of maintaining the meters and hydrants was distributed according to their respective numbers. The expenses of the Rockaway Park Auxiliary Station were all assigned to Queens. Fire insurance and maintenance of buildings were distributed according to investment in buildings, maintenance of standpipe at Rockaway Park was assigned to Queens and that at Far Rockaway was divided equally between Queens and Nassau. The expense of permits and tapping was distributed according to the number of new taps placed during the preceding four years, respectively.

The distribution of the operating expenses attributable to fire service was gone into with similar detail.

Property attributed exclusively to domestic service

	DOMESTIC SERVICE	FIRE PROTECTION
Meters, corporation cocks, valve boxes and manholes in Queens other than hydrant valve boxes, and on trunk mains in Nassau, filters, electrical equipment, coal storage, railroad siding, buildings at Far Rockaway, tools, supplies and miscellaneous equipment, going value	100 per cent	
Property attributed in part to domestic service and in part to fire protection		
Trunk mains in Nassau	78.3	21.7
Valves on trunk mains in Nassau	78.6	21.4
Land used for wells and pumping stations	66.7	33.3
Wells and suction lines	66.7	33.3
Building and chimneys at pumping stations	75.0	25.0
Boilers, pumps and auxiliaries	50.0	50.0
Mains in Queens	78.0	22.0
Pavements over mains in Queens	70.0	30.0
Valves other than hydrant valves in Queens	81.3	18.7
Standpipes	50.0	50.0
Property attributed exclusively to fire protection		
Hydrants and connections in Queens		100.0
Hydrants valves in Queens		100.0
Hydrant valves boxes in Queens		100.0
Total	76.8 per cent	23.2 per cent

The company showed that it kept certain employees and certain extra telephone equipment solely as a protection in case of fire emergency. Accordingly, 6 per cent of salaries, 40 per cent of office expenses, mainly telephone, and 10 per cent of pumping station wages were charged to fire protection. It was estimated that the expense of the Rockaway Park auxiliary station should be divided half and half between fire protection and domestic service. Of the cost of maintaining mains, 10 per cent was attributed to fire protection and the cost of cleaning pipes was distributed between domestic service and fire protection on the same basis that the investment in mains had been distributed, namely, 74 per cent for domestic service and 26 per cent for fire protection. Of the cost of maintaining the boilers, pumping machinery and buildings, 25 per cent was attributed to fire protection. The cost of maintaining standpipes was divided half and half. The cost of maintaining wells was divided in proportion to the distribution of the investment in wells, namely, 67 per cent to domestic service and 33 per cent to fire protection. Taxes were distributed in proportion to the investment, that is to say 74 per cent to domestic service and 26 per cent to fire protection. The cost of fire insurance was distributed on the same basis as the capital investment in buildings, boilers and pumps, namely, 62 per cent for domestic service and 38 per cent for fire protection. Stable and garage expenses were analyzed in detail with the result that 20 per cent was attributed to fire protection and 80 per cent to domestic service. A detailed examination of the bills of counsel led to the conclusion that about 20 per cent of the legal expenses should be attributed to fire protection.

The distribution of operating expenses attributable to the Queens area between domestic service and fire protection is given in the table on the following page.

FINAL RESULT

The net result of the method outlined, applied to conditions existing at the time of the appraisal, was a finding that 23 per cent of the total Queens investment and 15 per cent of the operating expenses and taxes were attributable to fire protection. With the allowance for depreciation and interest on investment, the cost of fire protection was found to be approximately 21 per cent of the total. The rates for "fire hydrant rental and fire protection" were fixed as follows: "For each fire hydrant set and maintained at the request of the city of New York, as a proper return on the special investment

CLASS OF EXPENSE	PERCENTAGE ATTRIBUTABLE TO DOMESTIC SERVICE	PERCENTAGE ATTRIBUTABLE TO FIRE PROTECTION
Salaries	94.0	6.0
Stationery and office supplies	100.0	
Office expenses (including telephone)	60.0	40.0
Operation of pumping stations:		
Wages	90.0	10.0
Coal	100.0	
Oil, packing, waste, light	100.0	
Minor equipment	100.0	
Rockaway Park Station	50.0	50.0
Reading meters	100.0	
Bottling	100.0	
Stable and garage expenses	80.0	20.0
Operation of filter	100.0	
Brooks and streams	100.0	
Maintenance of mains	90.0	10.0
Maintenance of boilers	75.0	25.0
Maintenance of machinery (including pumps)	75.0	25.0
Maintenance of buildings	75.0	25.0
Maintenance of meters	100.0	
Maintenance of standpipes	50.0	50.0
Maintenance of wells	67.0	33.0
Maintenance of hydrants		100.0
Maintenance of tools	100.0	
Cleaning pipes	74.0	26.0
Permits and tapping	100.0	
Inspection and collection	100.0	
Fire insurance	62.0	38.0
Life insurance	100.0	
Miscellaneous expenses	100.0	
Legal expenses	80.0	20.0
Taxes	74.0	26.0
Total	85.0	15.0

devoted exclusively to public purposes, and to cover maintenance thereof and depreciation and taxes thereon, $8.70 per annum. As a proper return on that portion of the general investment made necessary by the need for fire protection, and to cover maintenance thereof and depreciation and taxes thereon, and for water reasonably necessary for sprinkling streets and for flushing streets and sewers, where such water is taken from fire hydrants, $30,000 per annum." Water for public purposes, except such as obtained from hydrants, is to be paid for at the established meter rates.

Under the old system the company would have been paid by the city $12,460 for fire hydrant rental for the 632 hydrants on the company's mains against the new rate of $35,498; this increase was offset by a corresponding reduction in domestic rates. The new rate was equivalent to $56 per hydrant, which unit cost, however, will be reduced as the number of hydrants is increased.

The gross earnings of the company on the Queens business during the year ending May 31, 1914, was, in round figures, $173,000.

Assuming a fair return of 7 per cent on the company's investment, the gross earnings to cover operating expenses and taxes, depreciation and return on investment was found to be $167,000. The difference of $6000 plus the increased payment by the city for fire protection of $23,000 gave a total reduction of $29,000 from the revenue obtained from domestic consumers and the rates were correspondingly reduced.

The investigations were made during the past year under instructions from Mr. Delos F. Wilcox, deputy commissioner of Water Supply, Gas and Electricity, those interested are referred for further details to his full report "In Relation to the Queens County Water Company" dated June 1, 1915, made to Hon. William Williams, commissioner of the department.

DISCUSSION

Mr. Louis L. Tribus: Mr. Goodman has presented a number of items of considerable interest in connection with the study of fire protection as furnished by the Queens County Water Company, in portions of Queens and Nassau Counties, New York.

The subject of remuneration for fire protection has rarely been given the best kind of study, though it is a very important feature in the service rendered by a water plant. It is very difficult, however, and probably unwise to attempt to deduce a general rule that would purport to have general applicability, from any particular case, for most communities have their own individual peculiarities.

The payment for fire protection is the communities expression of interest and participation in the work of a water plant. It is a matter of vital importance where a private company is rendering the service and is a matter of large importance where the community is itself doing so, for the receipts for fire protection have a bearing upon the rates payable for domestic and manufacturing use also.

As to the Queens County Water Company, the speaker has been familiar with its conditions from practically the inception of the company; he was associated with its first chief engineer and superintendent.

In the early days of the company's operations, its chief supply of water was derived from a series of driven wells located along the line of the Long Island Railroad in Far Rockaway, but over draught brought salt water infiltration and some evidence of sewage contamination, consequently the ruin and abandonment of the plant. As then situated the question of fire protection from the physical viewpoint presented no unusual difficulties or peculiar conditions.

When, however, the new supply was developed many miles to the northeast, and increased quantities had to be furnished miles to the southwest, the furnishing of adequate fire protection became a very important feature in the design of the plant and the company's operations in general. The territory covered, included a large area sparsely settled comparatively near the new pumping plant; to the westward, the village of Far Rockaway fairly well built up and covering considerable area; then a long neck of land but sparsely occupied, and still further to the southwest a long and narrow tract densely occupied in large part by amusement resorts of very flimsy construction.

Except in small districts the whole territory has been inhabited for but a few months during the summer season. Fire protection, however, has to be maintained throughout the year though the actual risk during the closed season is not specially great.

In an ordinary community the insurance companies would be right to differ from that opinion and the speaker would not express it, for there would be sufficient occupancy of many of the buildings during the winter season to cause a certain amount of risk from overheated furnaces, stoves, etc., but the closing is so complete in much of the territory served by the Queens County Water Company that danger points are few in number.

To furnish adequate fire pressure with the pumping station 6 or 7 miles away from the district of greatest risk with a considerable area to be first supplied with water makes a problem quite difficult of solution; that is, without entailing undue pressure upon the pumping machinery and an unnecessary pressure throughout the larger district, or as an alternative, a large main for the exclusive use of the western territory without any earning value for much of its length.

The company has tried to solve these various problems by means of adequate mains, two standpipes, a supplemental station and rather heavy pumping pressure at times. These steps have resulted in giving serviceable and adequate fire protection throughout the whole territory for the whole period of years in which the system has been maintained.

There have been two general theories of public payment for fire protection, both of course predicated upon the supposed value of the service rendered, with fairness to the public and justice to the company.

The more general method that has prevailed has been an annual payment per hydrant in place, at rates ranging from $100 down to as low as $5. These rates were primarily fixed by clever promoters negotiating with officials who desired to secure a water system for the community and who knew little of the value of the service, other than by the representations made, and usually confirmed, that fire insurance rates would be materially lowered after the water system was put in operation. The lowering of rates from ¼ to ½ represented a gross saving for the average community, in any case, in excess of the prospective hydrant rental, so that it looked like a good bargain from the community's standpoint. In the promoter's eyes the hydrant rental would virtually cover the interest upon the prospective bonded debt, so that both parties were satisfied. Such contracts were usually made to run as long as the franchise periods, from 20 to 50 years and sometimes with the privilege of purchase by arbitration, or renewal of franchise and continuance of rental, etc.

The history of some of these transactions would be interesting but has little to do with the subject before the association, other than to indicate the customary way of arriving at a price. As franchises expired and contracts became renewable, more attention was paid to the real value of the service. By such time either the company was on a basis of fair money making, or had perchance passed through bankrupcty and the new owners becoming possessed of a valuable plant for a fraction of its real cost, gave less thought to the fire protection return, consequently if the same system of charging continued, it was at some arbitrarily agreed upon lower rate. Such rate had little bearing upon the value of the service given, representing simply a bargain or compromise.

It has been felt by many, however, who have given this subject consideration that better methods could be worked out to represent a fair return. When a water plant is comparatively small, the size of the mains in order to furnish adequate fire protection must be very much larger than would be necessary for ordinary domestic consumption.

In a place needing a comparatively small water system, the buildings are as a rule not abnormally high, consequently the pressure of domestic service need not be as great as required for fire protection.

Again, the use for domestic purposes has very much less variation throughout the busy hours of the day than that required for fire fighting. With these factors calculated, it becomes a fairly easy matter to estimate the larger sized plant required to give the greater flow in a short length of time, and the greater pressure required for fire service than that needed to meet the named conditions for domestic uses solely. An estimate of cost of the two plants then gives a fair basis upon which to compute the annual return to represent a fire protection charge. Of course to this must be added the expense of placing and maintaining fire hydrants, the extra cost of running the larger pumps and in general what might be called the "ready to serve" condition of the plant.

As a system increases in size, however, for a population that requires large daily consumption and higher pressures, due to the construction of taller buildings, there might well be reached a condition where the size of mains and the size of pumps would not need to be greatly increased to furnish fire protection, for they would be virtually large enough to render the combined service necessary with perhaps some slight local lessening of domestic pressure during the fire. Under such a condition it would appear as if almost the only expense of furnishing the fire service on the part of the company would be the placing and maintenance of the fire hydrants, yet the fact that the water system was in place and fire protection given, would, as in the other case named, result in keeping the fire insurance rates at a low figure with consequent great saving to the taxpayers. Some measure of that advantage should inure to the benefit of the water company whose plant makes the saving possible.

There is reason in every problem and to arrive at a just valuation of water service the different conditions must in all fairness be taken into consideration; structural and financial history of the water plant; its operating difficulties, its losses and gains; its replacements, its obsolences; its effect upon the community, whether its investment has made development and general community advance possible, or whether the community growth made the water plant possible.

A public utility corporation occupies a somewhat different place from ordinary business whose owners can discontinue it, or move it more or less at will.

A public utility is fixed, the capital is locked up and can not be removed; it has united with the community for better or for worse; it is subject to regulatory laws, sometimes oppressive ones; it must meet the whims of local officials it must in general suffer uncomplainingly and keep on spending money whether the return is satisfactory or not. Primarily of course the investment is made with the hope of handsome return, so that if such does not obtain, one may say that it is simply another case of a foolish investment and the owner must take the loss, but it is not an investment where the owners have the control. It rests with the community whether the enterprise be a success, or a failure, consequently the community is virtually a partner and morally must see that fair treatment is given and a fair return is made to those who have invested their hard cash. If the community gains largely as the result of the existence of the plant through low insurance rates, through greater comforts in living and through the easier pursuit of a livelihood, some of that gain should go the utility.

Fire protection payments are usually made as the outward indication of that community responsibility, so that the problem is not only one of establishing precisely the cost of rendering fire protection service, but rather an expression of the proper return from the community as a whole for the service rendered as a whole. This of course is independent of individual payment for water purchased which is personal and should be according to a strict business value of the service rendered.

The case of the Queens County Water Company lies somewhat between the extremes; it is no longer a small plant, nor has it reached the point where it is so large that fire protection factors would be negligible. The peculiar conditions are, as earlier referred to, the non-occupancy of a large territory during a considerable portion of the year; the fire service is rendered throughout the year, while the domestic service largely ceases, for long periods.

The speaker does not agree fully with the proportions which Mr. Goodman has assigned in the borough of Queens for respective domestic and fire service costs. In his judgment the fire protection factor is a considerably larger one. A comparison of estimated costs of such a system as would furnish adequate domestic supply solely and that which would furnish fire protection and domestic supply both is not a fair criterion alone of the value of its fire protection. Estimates make a good basis for getting at some figures in the case, but beyond them and beyond something allowed for the "ready-to-serve" operations, is the broader moral obligation, to which the speaker has referred; intangible, perhaps, in estimated fixtures but nevertheless worthy and proper to consider, bringing, in the last analysis, settlement of the problem rather along the lines of an equitable trade than a distinctively accounting proposition.

Mr. Morris R. Sherrerd: The last speaker (Mr. Tribus) mentioned that in a municipal plant the fire supply cost was only a question of accounting. There is a little more than simply a question of accounting involved, regarding the proportion charged in bookkeeping for fire service even in a municipal plant, since such cost affects the rates for water. In a municipal plant the charge for fire protection should be borne by the real estate, if this is not so then the water taker is paying more than he ought to pay, providing the municipality is carrying the whole expense of fire hydrant maintenance out of its water rent income, and this is done in many municipal plants. Water works managers ought to insist on a direct tax levy to maintain the fire service, and thereby be enabled to reduce the price of water to the water rent payer.

Mr. Charles R. Bettes: Mr. Goodman's paper covers a very important and much neglected matter, i.e., "A fair return for fire service." Only in the last few years has it received other than nominal attention; usually an arbitrary charge has been made depending on policy and conditions, but in no way representing any relation to actual cost of the service rendered.

Mr. Goodman's paper shows a careful consideration of the matter in the right direction. We are quite ready to agree with him in general theory, but not as to the results. Permit us to make clear, at this time, that the estimates from which his conclusions are drawn, except as to operating expenses, are his estimates, as the water company did not submit figures upon cost.

The company's estimate would differ as to reproductive cost and present value of the plant. It would differ, also, as to the proportion between domestic and fire service; that for fire service being materially increased. It would also differ as to the probable cost of a purely domestic system. Incidentally, it might be mentioned, that for a separate domestic system, an enforced use of equalizing house tanks could properly be considered.

Such tanks would, undoubtedly, add to the original cost but would tend to remove the enormous peak load and thereby effect a saving, not only in original plant outlay, but in its operating expense; thus reducing gross original cost for company and private investment, as well as annual operating expense.

A word as to this peak load, and incidentally as to operating expenses: For over eight months the daily consumption will average less than 2,000,000 gallons daily, ranging from 3,000,000 gallons maximum to 1,000,000 gallons daily minimum; for four months the consumption will average, say 4,500,000 gallons daily with a maximum rate, for a short time, of 14,000,000 gallons daily, and a minimum of 2,000,000 gallons daily. The varying rate demands a large pump reserve and necessitates a pump capacity of 23,000,000 gallons daily for service and 18,000,000 gallons daily for filter. All water is handled twice, to the filter and to final service. It is obvious that lessening of the peak would effect economy, both in original outlay and operating expense.

An objection might be made to Mr. Goodman's scheme in that he failed to fix some system that would automatically take care of additional cost chargeable to fire service on account of new extensions so as to allot the proper charge to fire and domestic service. We are inclined to accept, as covering this point, the recommendation of Mr. Alvord and Mr. Chester as logical and fair, i.e., a certain charge per foot, depending on size of mains. This, of course, to take effect after the initial cost of the service has been established.

Comparing Mr. Goodman's results with those of the Wisconsin Commission, we notice a wide difference. The Wisconsin cases were given very careful consideration by a most competent board, and it is difficult to reconcile such a variance, more especially, when the peculiar local conditions in the present case make the cost of the fire service more expensive and difficult than is the case in any of the plants dealt with by the Wisconsin Commission.

In allotting or apportioning the operating expenses as between fire and domestic service, every effort seems to have been made to make this as fair as possible. The data, however, were based on one year's expenses; using any other year would of course change the results somewhat one way or another.

The test referred to by Mr. Goodman as made in July was a very fortunate selection. Mr. Goodman, by the way, made the test. The day and hour was one on which draft was at the maximum. For the purpose of showing the dependable conditions under the most unfavorable circumstances, the selection could not have been better. Had all the fire resources in the fifth ward been called into service, less water would have been used, and the fact that there was still a residue pressure of some 10 or 11 pounds would indicate that the supply was ample. Since this test, the fire system has been reinforced by two 16-inch mains and many cross connections, thereby very materially bettering the conditions, and entirely removing any doubt as to the supply for fire purposes.

Mr. Goodman's paper shows skillful and conscientious work for which he deserves the thanks of the association. The paper should attract the attention of water works engineers and should be brought up at the annual convention when it can be open for a more general discussion. The company agrees with his theory and methods. While we do not agree as to the complete justice of his conclusions, we realize fully that in a pioneer case in this part of the country, it was for the interest of the company to have such conclusions most conservative; otherwise political considerations might easily have defeated any change. We do not consider that it would have been good business judgment for us to have contended for all that a scientific distribution of the gross revenue between the public and the private consumers would require.